



PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – May/June 2026

Date: 14 – 05- 2026

Time: 01:00pm – 04:00pm

School: SOE	Program: B. Tech.	
Course Code: IC Engines and Fuels	Course Name: MEC4009	
Semester: VI	Max Marks: 100	Weightage: 50%

CO - Levels	C01	C02	C03	C04	C05	C06
Marks	14	14	12	16	24	20

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.

10Q x 2M=20M

1.	Define swept volume, clearance volume, and total cylinder volume. Write the relationship between them.	2 Marks	L1	C01
2.	Define friction power? How is it calculated from indicated and brake power?	2 Marks	L1	C01
3.	Explain the process of cracking in petroleum refining. Why is it done?	2 Marks	L2	C02
4.	What is LPG? What are the major constituents of LPG? List two advantages of LPG as engine fuel.	2 Marks	L1	C02
5.	What is meant by 'direct injection' in hydrogen-fueled engines? List advantage does it offer over carburetion.	2 Marks	L1	C03
6.	Define 'delay period' or 'ignition delay' in CI engines. What are these two phases?	2 Marks	L1	C04
7.	Define the effect of compression ratio on knock in SI engines?	2 Marks	L1	C04
8.	Differentiate between auto-ignition and pre-ignition.	2 Marks	L2	C04

9.	Describe the function of catalytic converter.	2 Marks	L2	CO5
10.	Compare the Bharat Stage emission norms with Euro norms.	2 Marks	L2	CO5

Part B

Answer the Questions.

Total Marks 80M

11.	Explain with a neat diagram the parts of an IC engine and the function of each major component.	10 Marks	L2	CO1
Or				
12.	A single cylinder 4-stroke engine at 1000 rpm has bore 115 mm, stroke 140 mm. Brake load = 60 N at 600 mm radius. Mechanical efficiency = 80%. Compute: (i) BP, (ii) IP, (iii) Indicated MEP.	10 Marks	L2	CO1

13.	Describe the performance and emission characteristics of using LPG in engines.	10 Marks	L2	CO2
Or				
14.	Explain in detail the gaseous fuels used in IC engines: (i) Hydrogen, (ii) CNG, and (iii) Biogas.	10 Marks	L2	CO2

15.	A four-cylinder, four-stroke diesel engine produces 150 kW at 1800 rpm. The brake specific fuel consumption is 0.22 kg/kWh. At the start of injection, the cylinder pressure is 28 bar, and the peak pressure is 55 bar. The fuel injection pressure is 220 bar, and the maximum pressure in the injector is 480 bar. Given: • Coefficient of discharge $C_d = 0.72$ • Specific gravity of fuel = 0.86 • Atmospheric pressure = 1 bar • Injection duration = 18° crank angle • Effective pressure difference = average pressure difference Determine: • Total orifice area required per injector.	10 Marks	L3	CO3
Or				
16.	A carburetor has a venturi throat diameter of 18 mm with a coefficient of air flow of 0.82. The fuel jet diameter is 1.0 mm, and the coefficient of fuel flow is 0.68. The gasoline level in the float chamber is 4 mm below the venturi throat. Given: • Density of air = 1.18 kg/m³ • Density of gasoline = 720 kg/m³	10 Marks	L3	CO3

	- Pressure drop across venturi = 0.075 bar Determine: - Air-fuel ratio neglecting nozzle tip effect - Air-fuel ratio considering nozzle tip effect - Minimum air velocity required to initiate fuel flow			
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17.	Compare auto-ignition, pre-ignition, and knocking with suitable examples.	10 Marks	L4	CO4
Or				
18.	Describe the phenomenon of knocking in SI engines. Analyze the influence of the following on knock intensity: (i) compression ratio, (ii) engine speed, (iii) spark advance, (iv) fuel octane number. Suggest methods to suppress knock.	10 Marks	L4	CO4

19.	Examine the thermal reactor system and analyze its role in reducing HC and CO emissions.	20 Marks	L4	CO5
Or				
20.	Explain the homogeneous and heterogeneous combustion process in IC engines. Appraise how the type of mixture formation affects combustion in SI and CI engines.	20 Marks	L4	CO5

21.	Examine in detail the working of catalytic converters, including three-way converters, and analyze their effectiveness in emission control.	20 Marks	L4	CO6
Or				
22.	Critically analyze the evolution of Bharat Stage emission norms in comparison with European emission standards and evaluate their role and effectiveness in controlling vehicular pollution.	20 Marks	L3	CO6